

## **SECTION 11224 - RECIRCULATING CHOPPER PUMPS**

### **City of San Diego, CWP Guidelines**

#### **PART 1 -- GENERAL**

##### **1.1 WORK OF THIS SECTION**

- A. The WORK of this Section includes providing recirculating chopper pumps with motors, discharge pipe, recirculation valve and nozzle, baseplate, and all appurtenant work.

##### **1.2 RELATED SECTIONS**

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

- 1. Section 11175 Pumps, General
- 2. Section 11000 Equipment General Provisions
- 3. Section 13300 Instrumentation and Control

##### **1.3 SPECIFICATIONS AND STANDARDS**

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

- |            |  |
|------------|--|
| ASTM A 148 | Steel Castings, High Strength, for Structural Purposes |
| AISI 1144  | Stressproof Steel                                      |

##### **1.4 SHOP DRAWINGS AND SAMPLES**

- A. In addition to the requirements of Section 11175, the following shall be submitted in conformance with Section 01300:
  - 1. Technical brochures, bulletins, and data sheets for all control and instrumentation components.
  - 2. Control panel layout drawings, wiring, and schematic diagrams.

##### **1.5 OWNER'S MANUAL**

- A. Owner's Manual shall comply with the requirements of Sections 01300 and 11175.

##### **1.6 SERVICES OF MANUFACTURER**

- A. Manufacturer's services for training OWNER'S personnel, equipment system testing, and startup shall comply with the requirements of Section 11000.

- B. **Inspection, Startup and Field Adjustment:** An authorized service representative of the manufacturer shall visit the site for not less than [2] days to furnish the indicated services.
- C. **Instruction of OWNER'S Personnel:** The authorized representative shall instruct the OWNER'S personnel for not less than [1] day.

## 1.7 FACTORY TESTING

- A. In addition to the factory tests indicated in Section 11175, each pump shall be tested for the following:
  - 1. Impeller, motor rating, and electrical connections shall first be checked for compliance with the Contract Documents.
  - 2. Prior to submergence, the pumps shall be run dry to establish correct rotation and mechanical integrity.
  - 3. The pumps shall be run for 30 minutes submerged at 1/4, 1/2, 3/4 and full flow, without cavitation or overheating.
- B. A written report stating the tests have successfully been completed and providing the results of the test shall be furnished for each pump.

## PART 2 -- PRODUCTS

### 2.1 GENERAL

- A. Each pump shall be the vertical, wet pit, modified centrifugal design specifically intended to recirculate and pump [scum at heavy consistencies. Solids will be heterogenous mixture of inorganic and organic materials typically found in municipal sewage.]
- B. Solids shall be macerated and conditioned by the pumps as an integral part of the pumping action. Pumps shall have the demonstrated capability to chop and pump high concentrations of plastic, rags, grease and hair balls, stringy materials, and wood and paper products without plugging.
- C. Pumps shall be designed for continuous operation under submerged, partially submerged, and totally dry condition without damage.
- D. Provide lifting lugs or eye bolts. All exposed nuts, bolts, and hardware shall be stainless steel. Alignment of all components from the motor through the impeller shall be maintained by machine fits and concentric bores.

### 2.2 [\$# Pump Name #]\$

#### A. General

- 1. Recirculating chopper pumps shall conform to the following:

Number of pumping units:	-	[	]
Location:	-	[	]

Service:	- [ ]
Operation: hours per day	- [ ]
Drive:	- [constant]speed

#### B. Operating Conditions:

1. Capacity: (gpm)
  - max. - [ ]
  - at design point - [ ]
  - min. - [ ]
2. NPSH available at suction: (ft) - [ ]
3. Pump head: (TDH feet)
  - at max gpm - [ ]
  - at design point - [ ]
  - at min. gpm - [ ]
4. Total discharge head (ft)
  - at min. capacity - [ ]
5. Liquid to be pumped: - [scum]
6. Size of solids to pass (in) - [ ]
7. Specific gravity of liquid: - [ ]
8. Liquid temperature:(degrees F) - [ ]
9. Min. pump efficiency
  - at design point (percent) - [ ]
10. Max. pump speed: (rpm) - [ ]
11. Min. motor size: (hp) - [ ]
12. Power supply: - [480-volt][3-phase] [60Hz]

#### C. Pump Dimensions

1. Min size of discharge flange: (in) - [ ]
2. Flange rating: (psi) - [ ]
3. Pump length: (in) - [ ]

### 2.3 PUMP REQUIREMENTS

- A. **General:** All components shall be designed to safely withstand forces resulting from flow reversals up to 125 percent of maximum speed within the pump during shutdown caused by power

failure.

B. **Pump Construction:** Construction of the recirculating chopper pumps shall conform to the following requirements:

- |     |                   |   |  |
|-----|-------------------|---|--|
| 1.  | Casing            | - | Ductile iron, ASTM A 536, of semi-concentric design, with smooth passages. Fabricated casings will not be accepted.  |
| 2.  | Impeller          | - | ASTM A 148 grade 90-60 heat-treated cast alloy steel with minimum 550 Brinell hardness, semi-open type, 3-bladed, with pump out vanes and sharpened leading edges. Clearance between impeller and cutter bar shall be 0.010 to 0.015 inch. Impeller shall be bolted in position without set screws or axial adjustment. Fabricated impellers will not be accepted. |
| 3.  | Cutter bar plate  | - | Same material as impeller, funnel-shaped and recessed into bowl, extending diametrically across entire suction opening.  |
| 4.  | Shaft             | - | AISI 1144 Stressproof steel  |
| 5.  | Coupling          | - | Heavy duty, oversized, minimum service factor of 1.5 based on drive horsepower.  |
| 6.  | Bearings          | - | Double and single row ball bearings with 100,000 hour L-10 life and separate bearing and seal subassembly.   |
| 7.  | Seal              | - | Mechanical, with Alloy 20 bellows and silicon carbide faces. Seals shall ride on Type 316 stainless steel sleeves with tension controlled by set screws. A Type 316 stainless steel protective shield shall enclose the seal bellows.  |
| 8.  | Support column    | - | Flanged, 4-inch, precision steel tubing. Distance between shaft bearings shall not exceed critical speed dimensions.   |
| 9.  | Lubrication       | - | Oil lubricated shaft, I.O.S. Grade 46 turbine oil, with automatic oil level monitor and switch to shut off motor in case of low oil level.   |
| 10. | Pump base         | - | Min 1/2-inch thick, cast iron or steel plate with 150 psi discharge flange.  |
| 11. | Diverter valve    | - | ASTM A 536 ductile iron  |
| 12. | Operating handles | - | Control direction of nozzle discharge and  |

proportion of flow recirculated and pumped out, located above the pump base.

- [13. Automatic diverter -  
valve actuator

Ball screw linear actuator to control diverter valve position, [120 VAC] - powered, travel controlled by externally adjustable limit switches in NEMA 4X housings, factory adjusted such that RECIRC position recirculates 100 percent of flow and PUMPOUT position recirculates 25 percent of flow and discharges 75 percent of flow.]

14. Recirculation nozzle -

Adjustable 215 degrees horizontally and 70 degrees vertically.

- C. **Drive:** [Direct drives with vertical mounted, weather protected Type II electric motor in accordance with Section 16040.]

## 2.4 CONTROLS

- A. **General:** All instrumentation and control components shall meet the applicable requirements of Section 13300.

### B. Control Panel

1. Provide a NEMA [4X] control panel suitable for rack mounting. Identified terminal strips shall be provided for interconnection of external conductors.

2. Each panel shall be served by [120V AC] power.

- [3. Operator Interfaces: As a minimum, provide the following functions on the face of each control panel.

#### a. Hand switches

- (1) LOCAL/DCS for each pump
- (2) Pump START/STOP for each pump
- (3) Diverter valve RECIRC/PUMPOUT for each pump

#### b. Alarm

- (1) Oil level LOW for each pump

#### c. Status

- (1) Panel Power ON
- (2) Pump ON/OFF
- (3) Diverter Valve RECIRC/PUMPOUT position]

- [4. External Interfaces: Provide the following interfaces between the control panel and other equipment.

- a. Discrete Outputs from Control Panel to DCS. Provide the following maintained contact outputs which will be used as discrete inputs by the DCS.
    - (1) DCS (contact closed when DCS mode selected).
    - (2) Pump ON (contact closed when ON).
    - (3) Oil level LOW (contact closed when LOW).
  - b. Discrete Inputs to Control Panel from DCS:
    - (1) Pump RUN (maintained contact closed on RUN).
  - c. Discrete Input from Oil Level Monitor: Sensing voltage shall be 120V AC.
  - d. Discrete Output to Diverter Valve: Command valve to RECIRC or PUMP OUT position.
  - e. MCC Interface: Provide a maintained dry contact RUN output for use in motor starter circuit. Accept a dry contact ON maintained input from motor starter. Sensing voltage supplied by scum pump control panel shall be 120V AC. Motor starter and starter circuits are provided under Division 16.]
5. System Operation:
- a. When LOCAL is selected, provide manual START/STOP control of the scum pumps and manual RECIRC/PUMPOUT control of the diverter valve. When manual start is initiated, run the pump for a time interval set by an adjustable timer in the panel having a range of 0 to 15 minutes.
  - b. When DCS is selected, initiate the following sequence upon receiving RUN from the DCS:
    - (1) Command the diverter valve to the recirculation position. Run the pump for an adjustable time period.
    - (2) Command the diverter valve to the pumpout position and continue pumping.
    - (3) Continue pumping until the RUN command is removed.
  - c. In both DCS and LOCAL modes, shut down and lock out the pump when the oil level LOW alarm occurs. Provide manual reset of the oil level LOW alarm.]

## 2.5 CATHODIC PROTECTION

- A. Manufacturer shall provide one or more zinc anodes attached to each pump to provide cathodic protection for a minimum period of 2 years in continuous service.

## 2.6 SPARE PARTS

- A. The following spare parts shall be provided for each pump:
  - 1. [Two] sets all gaskets and o-rings

2. [Two] sets all bearings
3. [Two] sets mechanical seals
4. [One] impeller
5. [One] cutter bar plate
6. [One] set of impeller fastening hardware
7. [Five] cutter bar shims or cutter plate equivalent
8. [One] shaft sleeve

B. Spare parts shall be packed and boxed as indicated in Section 11000.

## 2.7 MANUFACTURERS

A. Pumps shall be manufactured by the following or equal:

1. Vaughan

## **PART 3 -- EXECUTION**

### 3.1 GENERAL

A. Pumping equipment shall be installed in accordance with the shop drawings and as indicated.

B. General installation requirements shall be as indicated in Section 11175.

- END OF SECTION -